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COMPLETE SPECIFICATION

Improvements in or relating to the Method of Concentrating Synthetic Latex

We, THE B. F. GOODRICH COMPANY, a corporation organised under the laws of the State of New York, United States of America, of 200, Park Avenue, New York, State of New York, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the concentration of synthetic resin latices.

It has long been known that natural rubber latex can be concentrated by treatment with certain colloidal materials known as creaming agents. This process consists merely in adding a small amount of the creaming agent to the natural rubber latex and permitting it to stand, whereupon a concentrated layer of rubber latex separates from the water or serum and can be removed by decantation. This concentrated latex is quite stable and can be transported or stored for long periods of time. The concentrate can be diluted with water until it regains approximately its original condition of fluidity. One of the chief advantages of this method of concentration is, of course, the great reduction in weight achieved, with consequent reduction in the cost of transport.

It has been attempted to apply this method of concentration to the various synthetic rubber latices, for example, latices containing copolymers of butadiene with styrene or copolymers of vinylidene chloride with butadiene. However, it has been found that such methods are not applicable to the synthetic rubber latices, and it has generally been believed that only natural rubber latex could be concentrated by treatment with creaming agents.

Now, however, it has been found that certain vinyl resin latices may be concentrated by treatment with creaming agents. In accordance with the invention a method is provided of concentrating a synthetic latex having as its base a resin prepared by the polymerization in aqueous emulsion of a monomeric material comprising vinyl chloride and/or vinylidene chloride, or of a mixture of vinyl chloride and/or vinylidene chloride with an ester of an acrylic acid, which method comprises adding to said latex a creaming agent in an amount of from 0.05% to 0.5% by weight of the water content of the latex and allowing the mixture to stand, whereby the concentrated latex can be separated from the serum. The latex may be prepared by polymerizing in aqueous emulsion vinyl chloride, vinylidene chloride, mixtures of these two materials with each other or mixtures of one or both of these materials with any of the esters of acrylic acid or of an alpha-substituted acrylic acid such as methacrylic acid, ethacrylic acid or alpha-chloracrylic acid all of which will be herein designated generically as "an acrylic acid." While it is preferred to use the well-known volatile esters of the lower alcohols such as methyl acrylate, ethyl acrylate or methyl methacrylate, other esters of an acrylic acid such as butyl acrylate, dodecyl acrylate, phenyl acrylate or ethylene diacrylate, may also be used.

Although the creaming agent used in the process of the invention may be any of the creaming agents used with natural latex, best results have been obtained with sodium alginate, ammonium alginate, and tragon seed gum. Satisfactory results have also been obtained with gum tragneanth, glue, and gelatin.

Although the acidity or basicity of the latex to which the method of the invention is applied may vary over a wide range, it has been found preferable, in order to obtain perfectly stable products, to adjust the pH to between 8 and 11 before adding the creaming agent. The con-

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centration of creaming agents added may likewise be varied over a wide range, from 0.05 to 0.5%, by weight based on the water content of the latex. It has been found, however, that for each creaming agent there is a range of concentration which gives maximum results. This optimum range varies with the particular creaming agent employed and can be readily determined by experiments. The optimum concentrations for ammonium alginate, for example, is about 0.15 to 0.20%, as will be shown in the specific examples described below.

When it is desired to prepare highly concentrated or specially purified latices, the creaming process may be repeated two or more times.

The following specific examples will serve more fully to illustrate the nature of the invention.

EXAMPLE I.

A synthetic resin latex containing 47.9% by weight of total solids was prepared by polymerizing in aqueous emulsion a mixture of 75 parts by weight of vinylidene chloride and 25 parts of methyl acrylate. To this latex was added in the form of a 1% aqueous solution 0.063% by weight of sodium alginate, based on the water content of the mixture of latex and alginate solution. The mixture was stirred sufficiently to insure thorough mixture of the ingredients, and then allowed to stand. Observations were taken at various intervals of time of the volume occupied by the resin-containing portion of the latex. A sharp dividing line existed between the white opaque latex and the transparent serum. The results obtained are as follows:

Time in Minutes	Volume of Resin-containing Portion of Latex in ml.
0	47
20	46
50	45
80	43
140	41

EXAMPLE II.

The same procedure was used with the same type of latex and various concentrations of a variety of creaming agents. The results are given in the table below:

Creaming Agent	Concentration in percent based on Total Water Content	Time in Minutes	Volume in ml.
Sodium Alginate	0.17	0	51
		140	35
	0.42	0	49
		140	31
Ammonium Alginate	0.063	0	49
		66	43
		1145	39
	0.17	0	52
		65	39
		1145	33
	0.42	0	56
		65	42
		1145	37
Gum Tragacanth	0.42	0	56
		1145	40
Tragon Seed Gum	0.42	0	53
		125	37

EXAMPLE III.

A latex containing 38.5% of total solids was prepared by the polymerization of a mixture of 75 parts by weight of vinylidene chloride with 25 parts of methyl acrylate. To 100 ml. of this latex there were added 10 mL of a 1% by weight aqueous solution of ammonium alginate. The mixture was stirred for a few minutes to insure thorough mixing of the ingredients and then was permitted to stand at room temperature. After about two days no further creaming occurred. The clear serum at the top of the container was then removed from the underlying resin-containing latex by de-

centation. The concentrated latex thus obtained was found to contain about 79% total solids.

EXAMPLE IV.

A synthetic resin latex containing about 50% total solids was prepared by polymerising a mixture of 80 parts by weight of vinyl chloride with 20 parts of methyl acrylate. The latex was filtered and the pH was adjusted to a value of 9.0 by the addition of ammonia, caustics, or other alkaline solution. Ammonium alginate in an amount equal to 0.1% by weight based on the total water in the mixture of latex and alginate solution was then slowly added with stirring to the latex. The ammonium alginate may conveniently be added in the form of a 1% aqueous solution. After the mixture was stirred for about 15 minutes to insure thorough mixing, it was allowed to remain undisturbed for 24 hours. The supernatant transparent layer was then decanted, and a latex was obtained in the bottom layer having about 65 to 70% total solids.

EXAMPLE V.

A latex containing about 23% total solids was prepared by polymerizing in aqueous emulsion a mixture of 90 parts by weight of vinyl chloride with 10 parts by weight of vinylidene chloride. To 20 ml. of this latex there was added 4 ml. of a 1% aqueous solution of sodium alginate. The volume of the concentrated latex (lower layer) at various intervals of time was as follows:

Time in minutes	Volume in ml.
0	24
21	22
930	10
2670	9.8

The concentrated latex, after 2670 minutes, contained about 45% total solids.

Although the creaming process has been described as being carried out at room temperature, it may be carried out at higher temperatures if desired. However, there is no particular advantage in carrying out the process at higher temperatures, and the latex obtained at room temperature is usually somewhat more stable. It has been found that the creaming process not only increases the resin content of the latex, but also reduces the concentration of various impurities sometimes present. It has been found that the concentrated latices may be diluted by the addition of water and that they are quite stable either in their concentrated form or after subsequent dilution. The separation of the concentrated latex from the serum after addition of the creaming agent may be accelerated by centrifuging the mixture.

It will be understood that various modifications may be made in the specific embodiments described without departing from the scope of the invention.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of concentrating a synthetic latex having as its base a resin prepared by the polymerisation in aqueous emulsion of a monomeric material comprising vinyl chloride and/or vinylidene chloride which comprises adding to said latex a creaming agent in an amount of from 0.05% to 0.5% by weight of the water content of the latex and allowing the mixture to stand, whereby the concentrated latex can be separated from the serum.

2. A method of concentrating a synthetic latex having as its base a resin prepared by the polymerisation in aqueous emulsion of a mixture of a monomeric material comprising vinyl chloride and/or vinylidene chloride with an ester of an acrylic acid, which comprises adding to said latex a creaming agent in an amount of from 0.05% to 0.5% by weight of the water content of the latex and allowing the mixture to stand, whereby the concentrated latex can be separated from the serum.

3. A method according to claim 2 in which said ester is methyl acrylate.

4. A method according to any of claims 1 to 3 in which the pH of the latex is adjusted to between 8 and 11 before adding the creaming agent.

5. A method of concentrating a synthetic latex substantially as hereinbefore described.

6. A concentrated latex whenever obtained by the method according to any of claims 1 to 5.

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